Cropping Strategies

By Karl Czymmek, Quirine Ketterings & Jerry Cherney

On-farm research network addresses potassium needs in alfalfa

Soil may supply adequate K

A potassium (K) rate trial, begun in 2000 at the Aurora, N.Y., Research Farm, is part of a long-term manure/compost/fertilizer comparison trial. It began with five years of corn silage, two rates of manure, two rates of compost and six rates of fertilizer nitrogen (N), along with phosphorus (P) and K, following Cornell University guidelines. The plots are on a calcareous soil (native pH 7.4).

In 2006, we planted alfalfa/grass and did not apply additional fertilizer to the manure or compost plots. After the establishment year we applied various rates of potash to the fertilizer treatments during the alfalfa years.

We continued to track yields during the life of the alfalfa stand and evaluated crop response to K on plots that had not received manure or compost during the corn years. This work provides insight on two issues: The value of manure after application years. And alfalfa response to K on soils with the potential to supply moderate K.

Value of manure

The average plot yield for the high rate of manure and both high and low rates of compost applied during corn silage was 1 ton of dry matter (DM) more per acre per year than the low rate of manure and fertilizer N plots over the five-year stand life. This was the case even when extra potash was added during the hay year.

The exact reason for the manure and compost response is hard to isolate, but it's likely due to a combination of micronutrients and organic matter-related benefits from manure and compost.

These yield data reflect the benefits to alfalfa of manure application during corn years. It also may be helpful information for dairy producers who move manure to neighboring crop farms.

Alfalfa response to K

During the corn years, soil test K levels on the fertilizer plots were just above the critical value, indicating some K might be needed. To test that, we applied five K rates on plots that did not have a manure or compost history. The plots included a no K control and four rates of potash, ranging from about 120 lbs. 0-0-60 per acre up to about 550 lbs. of 0-0-60 per acre.

There was no yield benefit from the annual K application in the four years when it was applied in the spring (**Table 1**).

Rates of 140 and 275 pounds 0-0-60 maintained or slightly increased soil test K. This suggests these rates, at this site, can hold K fertility steady during alfalfa years if that fits a dairy's goals.

The highest soil and forage tests came from the plots that had the highest K fertilizer rates (**Figure**

Results of research suggest soils supply a considerable amount of potassium for alfalfa without applying additional K. The research continues.

FYI

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Table 1. Potassium application and alfalfa yield response

	Alfalfa yield (tons/acre dry matter)				
	----------K applied in spring (lbs/acre)----------				
Year	0	83	166	255	335
2007	2.8	2.6	2.6	2.6	2.6
2008	6.3	5.9	6.5	6.7	6.9
2009	5.3	4.8	5.1	4.3	4.8
2010	3.0	2.5	3.0	2.4	2.9
4-yr. total	17.5	15.7	17.1	16.1	17.3

1). At this site, the extra K showed up in the soil and tissue tests but not in yield.

An above-ground biomass composition assessment before we harvested the crop last fall indicated that K applications didn't impact stand composition. The percentage of alfalfa remained high during the four years of application for all K rates, and measured by weight (biomass) in October before being terminated, the plots were still 60 to 70% alfalfa.

Research expanded

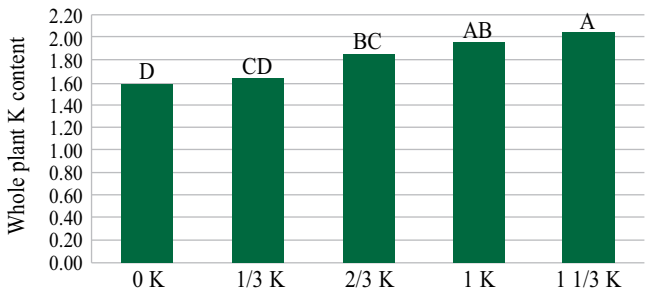
The results from the Aurora Research Farm suggest that soils supply a considerable amount of K. But results from a trial at one site don't generate recommendations for all of New York's alfalfa acreage.

To test the need for additional K on other soil types and under different growing conditions, we initiated a new project in 2009. As we've done with other crop research work, we sought help from our on-farm research collaborators – Cornell Cooperative Extension educators and consultants. The farmer board of the New York Farm Viability Institute supplies funding.

The first year we evaluated K response on 16 fields. Then in 2010 we added 30 fields to our database. We will continue this field project in 2011 and report final results next year.

When conducting statewide research, strong local connections are critical to working with farmers, helping with harvest and monitoring field conditions between harvests. See *Collaboration benefits dairies* for details.

Figure 1. Addition of potassium and plant K content



Treatments with different letters above the bars means they are significantly different from each other.

Collaboration benefits dairies

When James Kingston had the opportunity to conduct on-farm potassium (K) trials in alfalfa, the field crops specialist for the Northwest New York Dairy, Livestock and Field Crops Extension program put out the call to farmers in his region. The managers at Coyne Farms, an Avon, N.Y., 975-cow dairy, stepped up. The farm grows 550 acres of alfalfa.

Collaboration increases Extension's knowledge and, consequently, what information specialists can pass onto farmers, says James Kingston, field crops specialist for the Northwest New York Dairy, Livestock and Field Crops Extension program.

"Like many dairy producers, the Coynes are really concerned about the amount of K applied, and they don't want to put it where they don't need it," Kingston says.

The Coynes' concern about K began more than 20 years ago when their dry cow ration began to test high in potassium, says Malachy Coyne, a partner in the dairy. "I became more and more convinced that we didn't need all that potash for the cows, but I wondered about the impact on crop yield too," he says. As the person responsible for the dairy's ration, he's interested in their forages' mineral profile.

Colleen Daly, a senior service manager with Agricultural Consulting Services, Rochester, N.Y., says collaborative on-farm research helps get answers to what practices can be profitable for farms.

Fortunately for the Coynes, their crop and nutrient management consultant also participated in the K research with Kingston and the Cornell team. Colleen Daly, a senior service manager with Agricultural Consulting Services Inc. (ACS), Rochester, N.Y., knows her clients will benefit from this collaboration.

"We (ACS) can do research that's scientific enough," Daly says. "But connecting with Extension locally and at the University strengthens and broadens our efforts."

Both Kingston and Daly say that collaboration increases their knowledge network and, consequently, improves the scope and quality of information they can pass onto farmers.

"By participating in the K research, Daly and Kingston can bring the results of the trials and their own field observations to their farming audiences for quicker and larger-scale impact and for consistency in messages," says Quirine Ketterings, director of the Cornell Nutrient Management Spear Program. "This is a win-win situation for us all.

"Without this collaboration, we would not be able to conduct projects like the potassium for alfalfa one, as it requires a large number of fields to be included – 55 fields in the study to date," she says.

The goal of the collaboration is the same whether the participants represent private companies or public institutions. "We want to know what's the most profitable and economic thing for farms," Daly says.

She has already changed some nutrient recommendations based on the research. "Being there and seeing research results, I'm starting to use it," Daly says. "If farmers want answers, we encourage them to do a trial. It means a lot more to them when research happens on farms."

And it means a lot to farmers likes the Coynes to know their consultants participate in the research so they can bring them the latest information.

"It's a plus to have a trial on the dairy," Coyne says. "It keeps us in touch with the people doing the research. Maybe it's a only couple phone calls with each of four or five cuttings to let the researchers know we're cutting and when we've finished, but we stay in touch."

–By Eleanor Jacobs